

299-W11-60 (A7302) Log Data Report

Borehole Information:

Borehole: 299-W11-60 (A7302)			Site: 216-T-6 Crib		
Coordinates (WA State Plane)		GWL (ft)¹: Not deep enough	GWL Date: 10/20/2003		
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
136,664.45 m	567,171.28 m	July 1947	217.68 m	150	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	4.6	8 5/8	7 7/8	3/8	+4.6	150
The logging engineer measured the casing stickup using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated.						

Borehole Notes:

Borehole coordinates, elevation, and borehole construction information are from measurements by Stoller field personnel, HWIS³, and Chamness and Merz (1993). Zero reference is the top of the 8-in. casing. To vent possible radon gas, the borehole cap was left off overnight prior to logging.

Logging Equipment Information:

Logging System: Gamma 1E	Type: 70% HPGe (34TP40587A)
Calibration Date: 7/2003	Calibration Reference: GJO-2003-468-TAR
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3/Repeat		
Date	10/21/03	10/22/03	10/22/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	65.0	156.0	45.0		
Finish Depth (ft)	5.0	65.0	29.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N/A ⁴	N/A	N/A		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	AE055CAB	AE057CAB	AE057CAB		
Start File	AE056000	AE057000	AE057092		
Finish File	AE056060	AE057091	AE057108		

Log Run	1	2	3/Repeat		
Post-Verification	AE056CAA	AE057CAA	AE057CAA		
Depth Return Error (in.)	-1	N/A	-1		
Comments	Fine-gain adjustment made before logging.	No fine-gain adjustment.	Repeat section.		

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 118. Maximum logging depth achieved was 156 ft.

Analysis Notes:

Analyst:	Sobczyk	Date:	10/29/03	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. All of the verification spectra were within the acceptance criteria. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 7.4 percent lower and 2.7 percent higher at the end of the day.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Pre-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source files: G1EJul03.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 8-in. casing. The casing configuration was assumed to be one string of 8-in. casing to the maximum depth of the logging (156 ft). The casing correction factor was calculated assuming a casing thickness of 3/8 in. This casing thickness is based upon the field measurement. Water and dead time corrections were not required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. In addition, a comparison log plot of ^{137}Cs is provided to compare the data collected in 1993 and 1995 by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 609 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 1764 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected in two intervals: from near the ground surface (6 ft) to a log depth of 12 ft and between 28 and 39 ft. The range of

concentrations was from the MDL (0.4 pCi/g) to 28 pCi/g, which was measured at 33 ft. ¹³⁷Cs was also detected near the MDL (0.2 pCi/g) at 84 ft.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for ¹³⁷Cs (662 keV) and natural radionuclides (609, 1461, 1764, and 2614 keV). The ²³²Th concentration based on the 2614-keV photopeak does not repeat at 61 ft.

Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained minor amounts of man-made gamma radiation in 1976. The 5/6/76 log appears to detect relatively high gamma activity near 26 ft (8 m). The SGLS detected ¹³⁷Cs near the ground surface and in the interval between 28 and 39 ft.

Comparison log plots of data collected in 1993 and 1995 by Westinghouse Hanford Company (WHC) and in 2003 by Stoller are included. The WHC concentration data for ¹³⁷Cs are decayed to the date of the SGLS logging event in October 2003. ¹³⁷Cs concentrations as measured by the RLS are higher than that predicted when compared to the 2003 log near the ground surface. A casing thickness of 0.322 in. was used to estimate the ¹³⁷Cs concentrations based on the 1993 RLS data versus 0.31 in. for the 1995 RLS data and 0.375 in. for the 2003 SGLS data. For ¹³⁷Cs (based on 662 keV), use of a 0.375-in. casing thickness would increase apparent ¹³⁷Cs concentrations by approximately 11 percent relative to a 0.31-in. casing thickness and 10 percent relative to 0.322-in. casing thickness. Since 1993, ¹³⁷Cs activities near the ground surface (between 6 ft and 8 ft) may have decreased more rapidly than is predicted by radioactive decay alone.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, Pacific Northwest Laboratory, Richland, Washington.

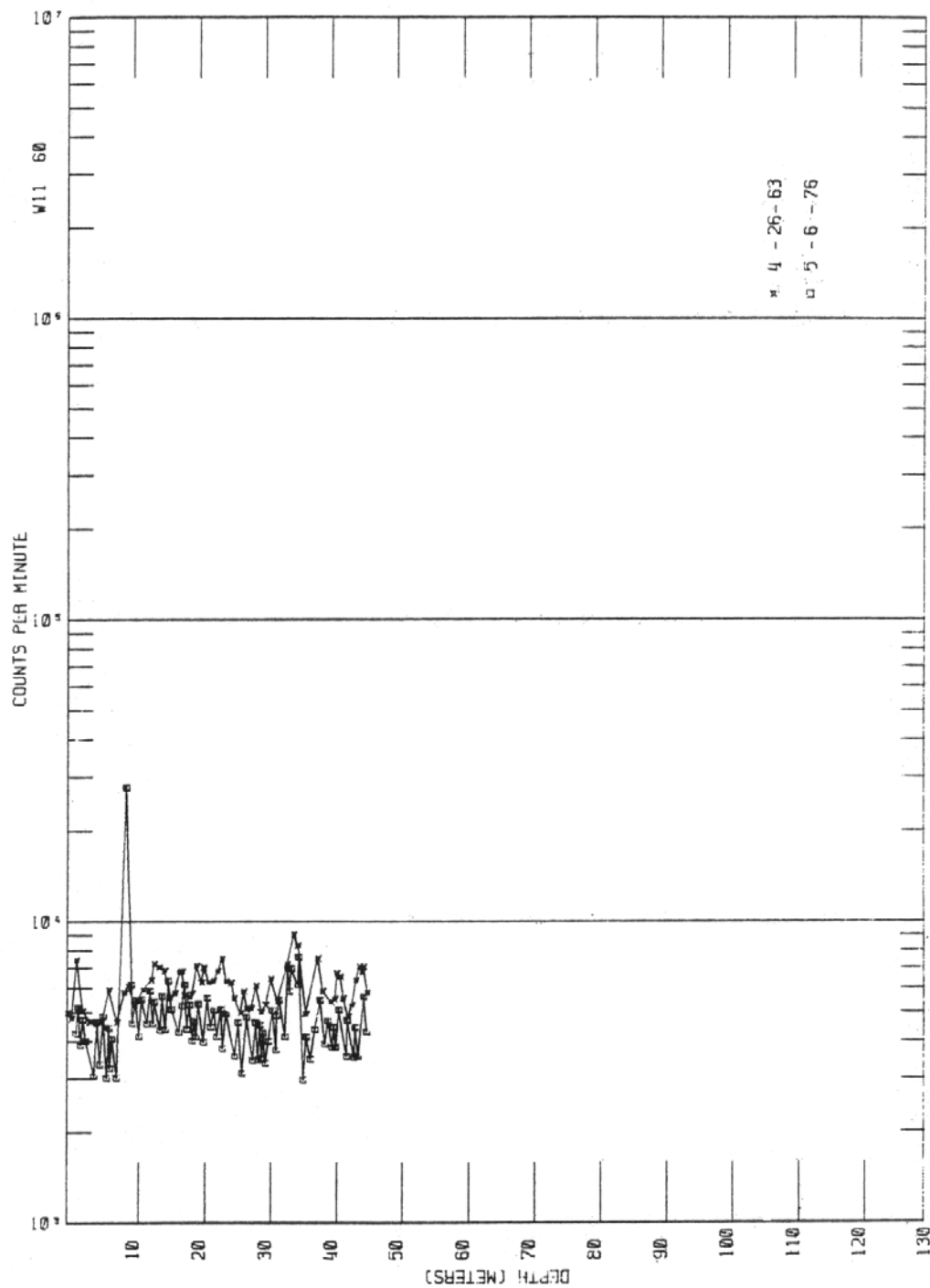
Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

¹ GWL – groundwater level

² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ N/A – not applicable



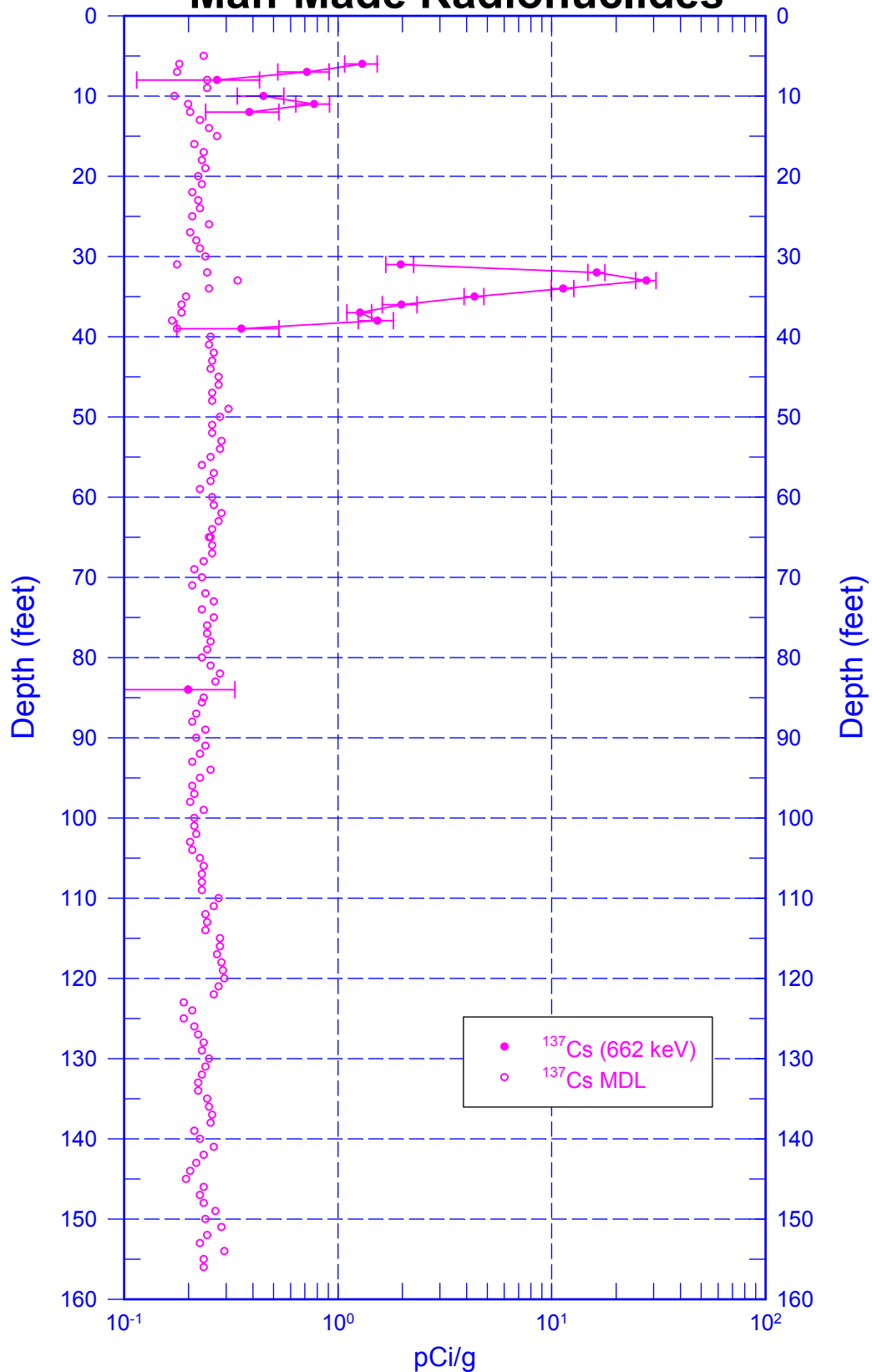
WELL W11-60 SCINTILLATION PROBE PROFILES

from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-W11-60, Logged on 4/26/63 and 5/6/76

299-W11-60 (A7302)

Man-Made Radionuclides

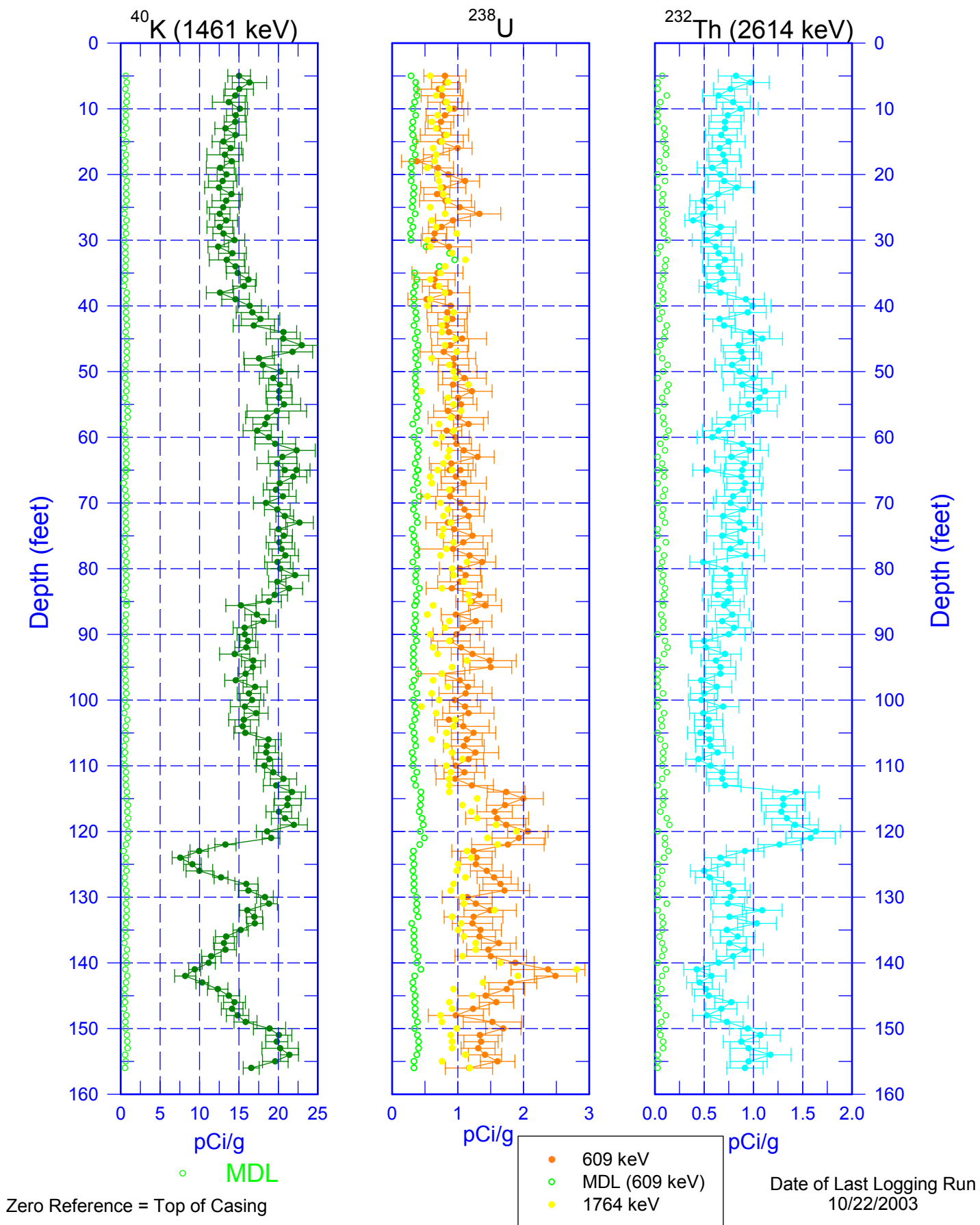


Zero Reference = Top of Casing

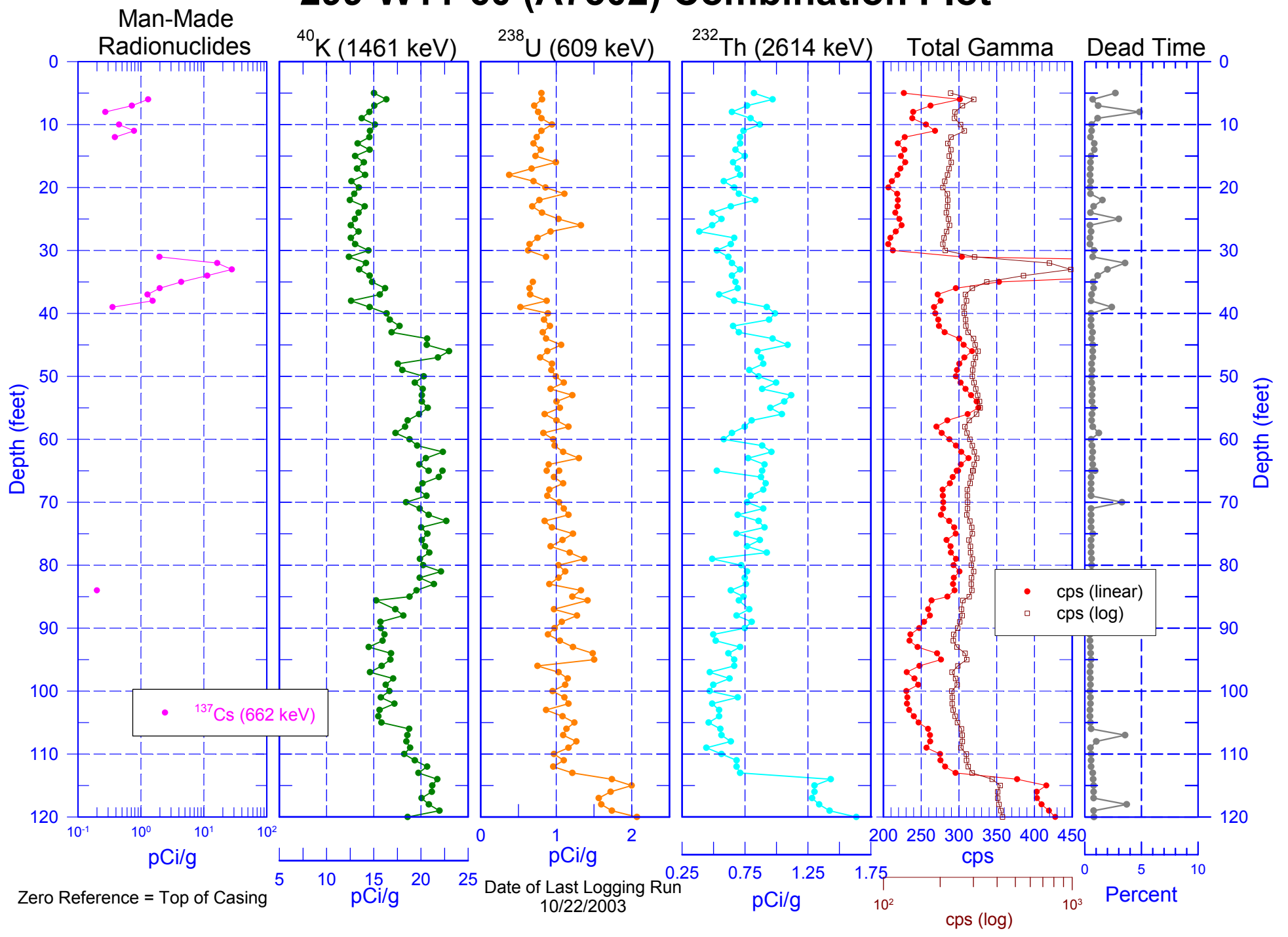
Date of Last Logging Run
10/22/2003

299-W11-60 (A7302)

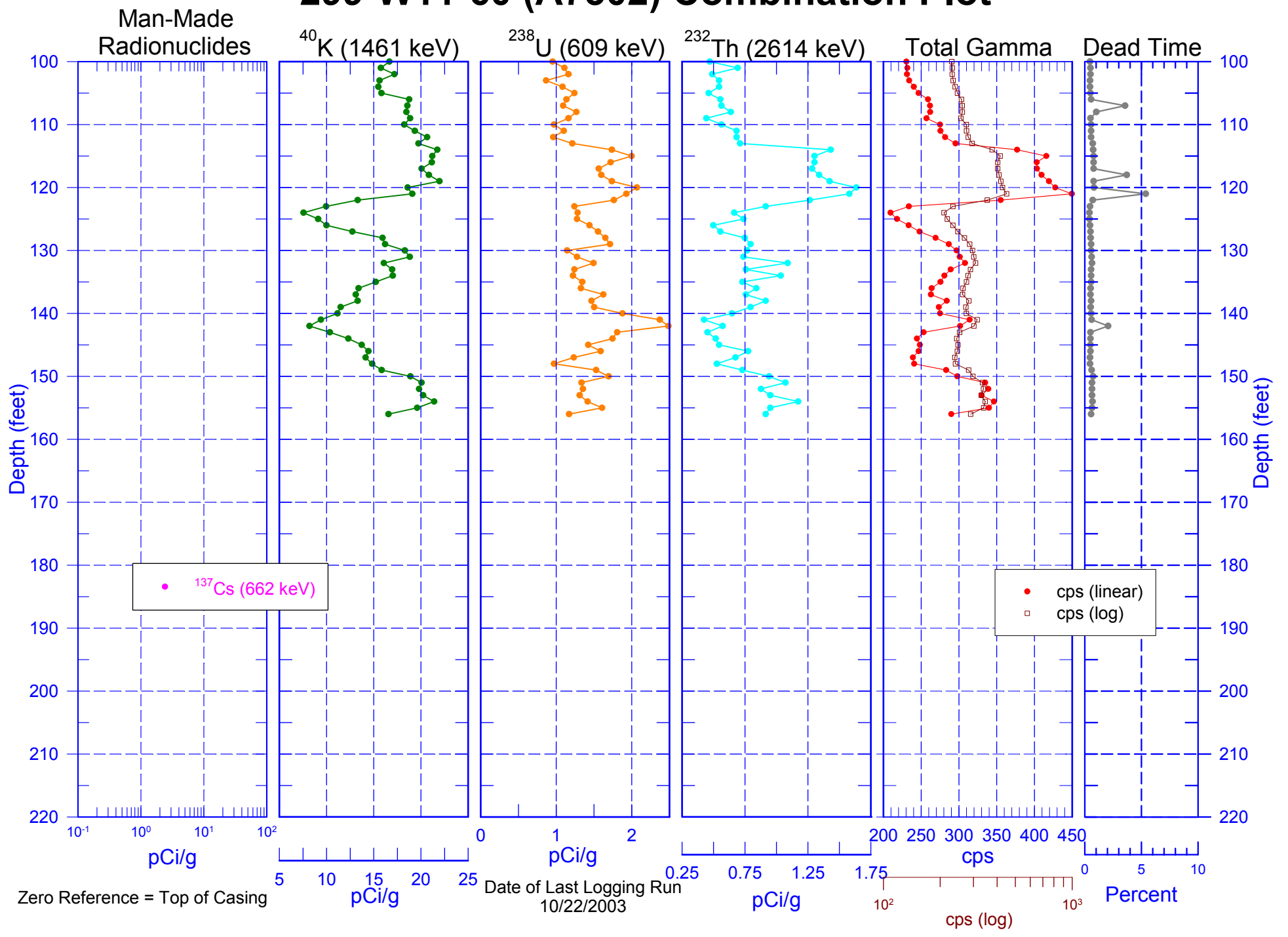
Natural Gamma Logs



299-W11-60 (A7302) Combination Plot

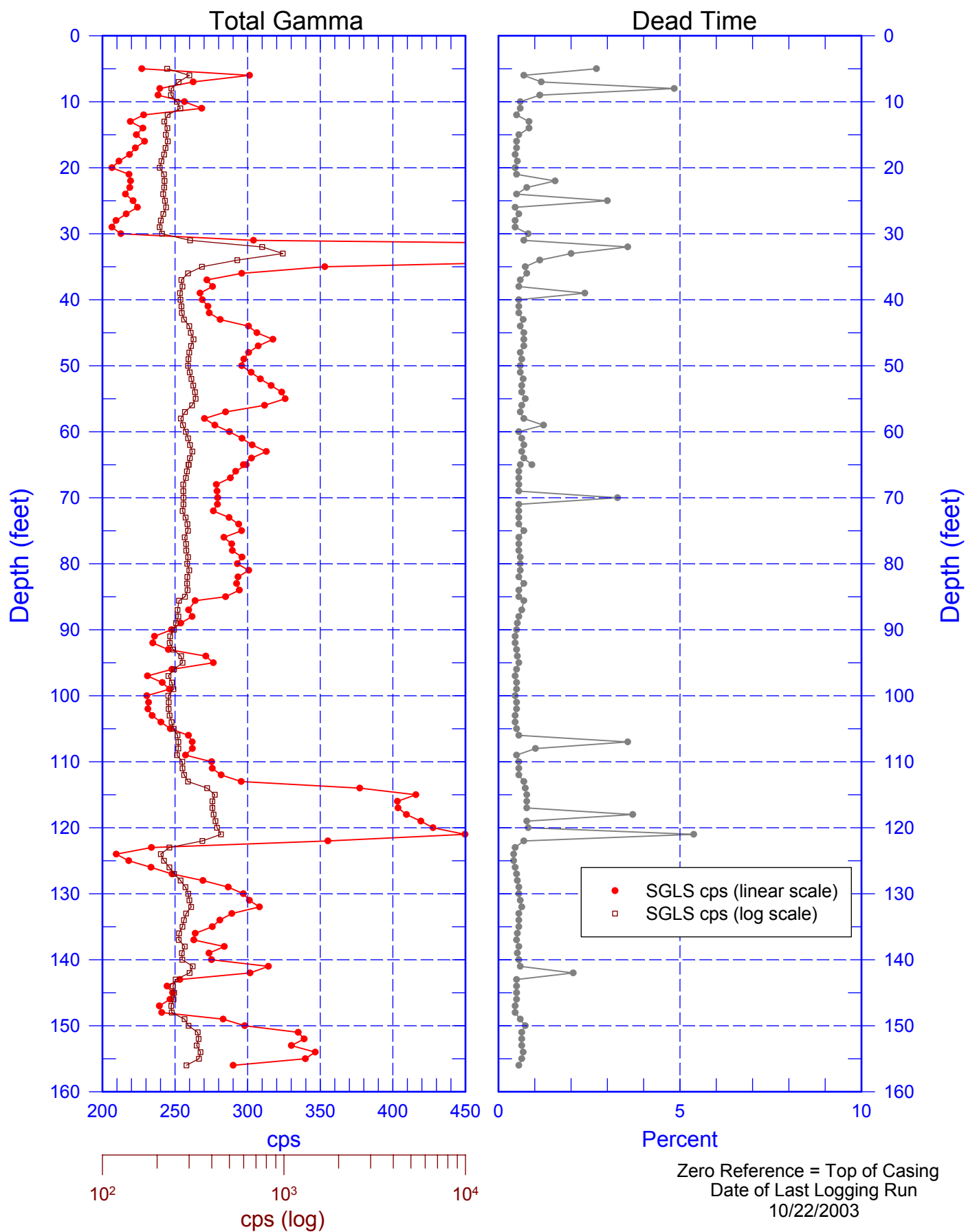


299-W11-60 (A7302) Combination Plot



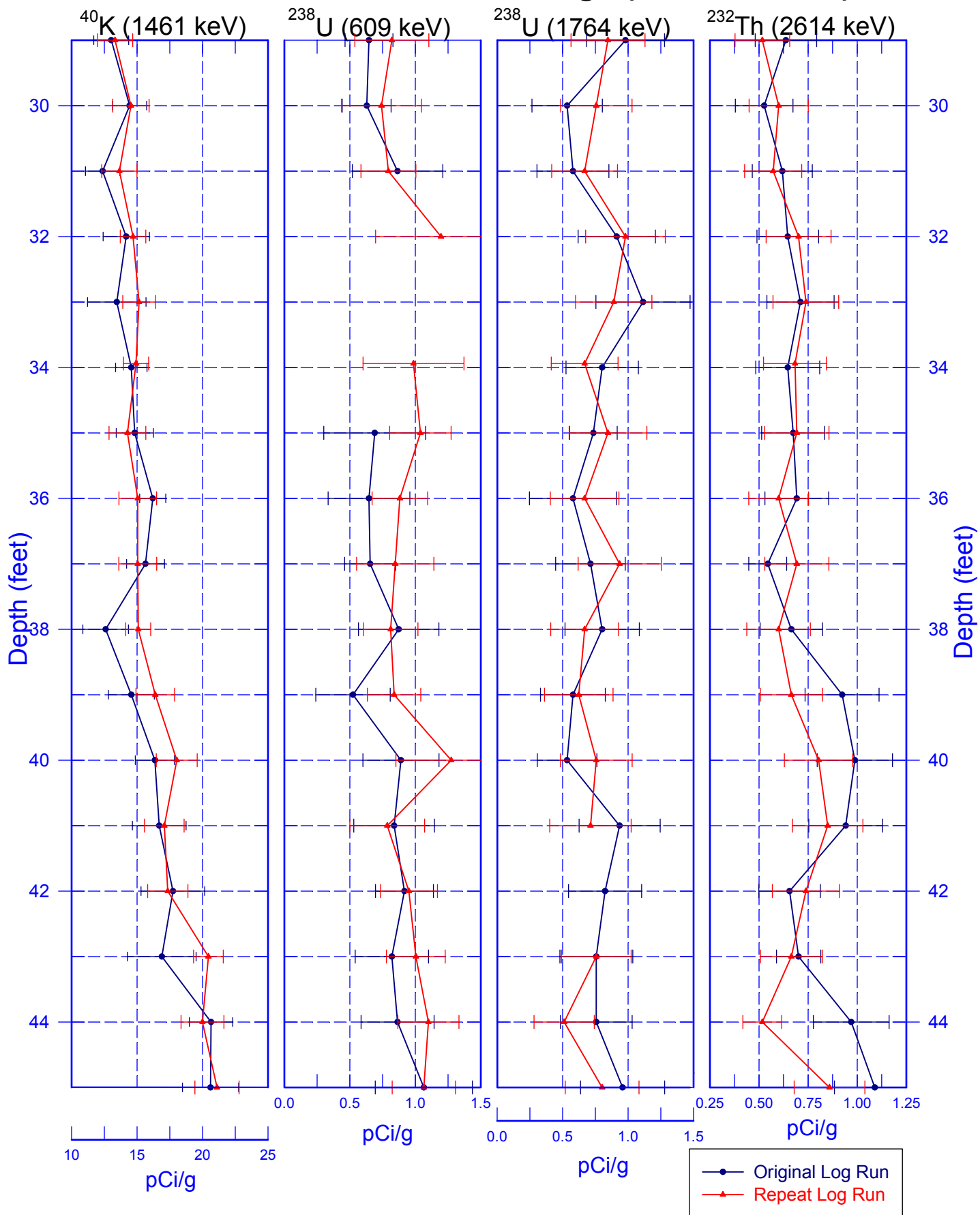
299-W11-60 (A7302)

Total Gamma & Dead Time



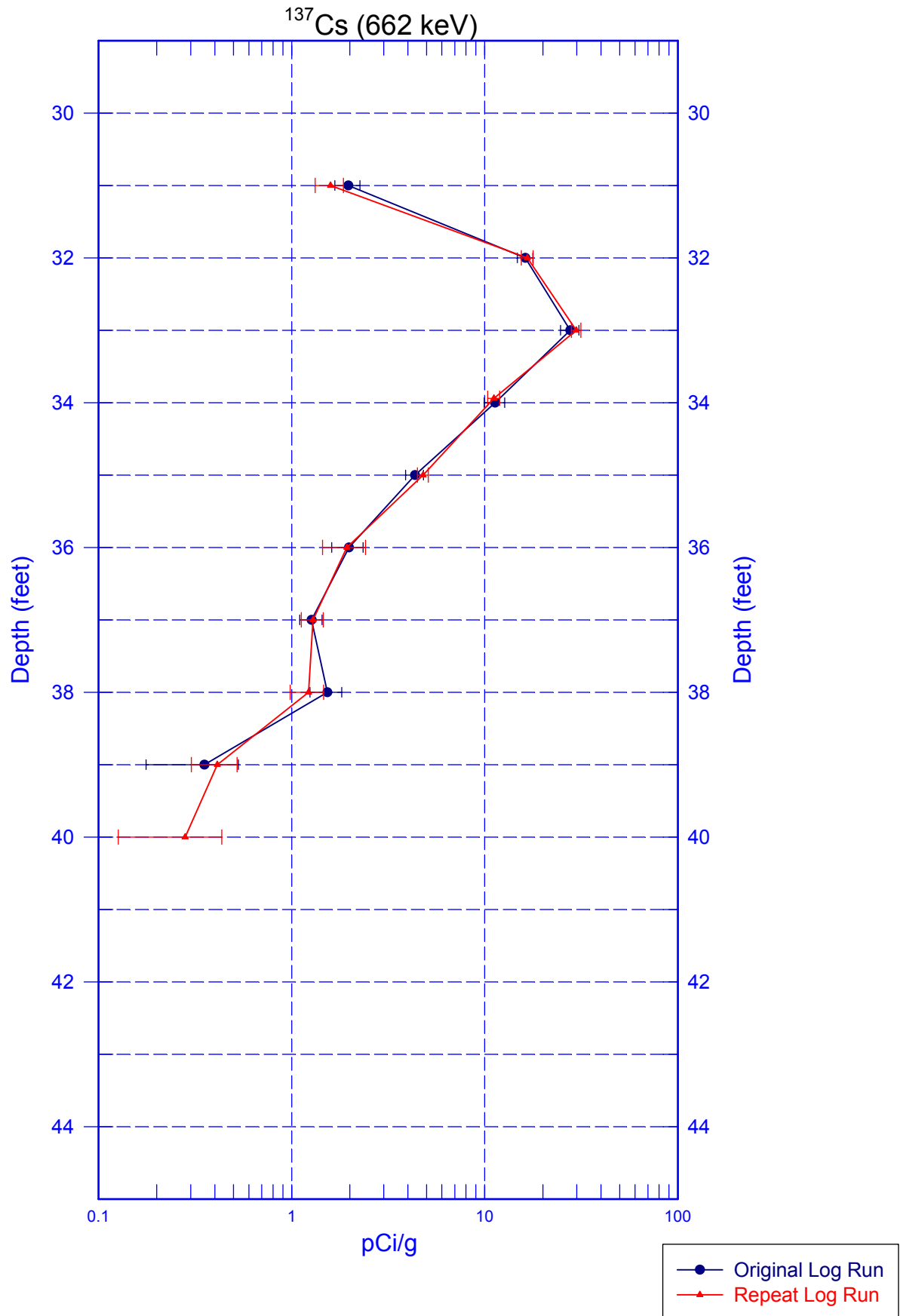
299-W11-60 (A7302)

Rerun of Natural Gamma Logs (45.0 to 29.0 ft)



299-W11-60 (A7302)

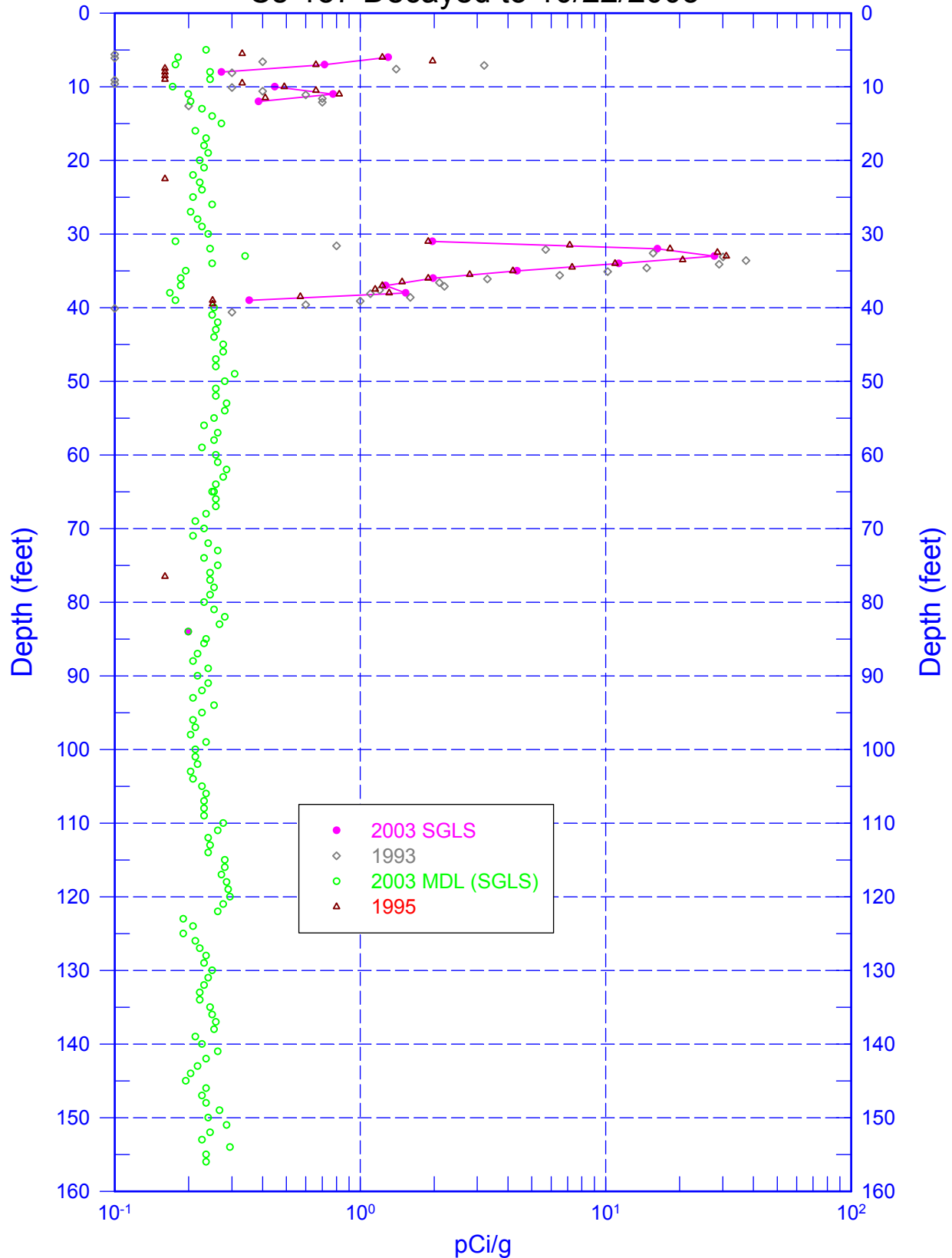
Rerun of Man-Made Radionuclides (45.0 to 29.0 ft)



299-W11-60 (A7302)

RLS Data Compared to SGLS Data

Cs-137 Decayed to 10/22/2003



Zero Reference = Top of Casing (2003 SGLS & 1995 RLS)
1993 RLS shifted +4.6 ft to align with the SGLS